

Wild Finnish Truffles

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Abstract: Truffle ascocarps were collected from a natural forest located in Lahti, Finland (100 km north to Helsinki) by the help of a trained truffle dog called Siro in Autumn 2006. By morphological identification, the truffles were identified as *Tuber maculatum* and *Tuber scirposum*. The truffle ascocarps were found in soil with relatively high pH value in coniferous forest. Our studies showed that both tuber species prefer the mixed forest with host-trees such as spruce and pine. Samples of the truffle fruit bodies are conserved in the collection of biological materials in the Juva Truffle Center. Further investigation concerning truffle species (DNA) and soil properties will be performed in the coming seasons.

Key words: Truffles; Forest; *Tuber*; Ascocarps; pH

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Introduction

Truffles in strict definition are hypogeous fungi of the genus *Tuber* which grow in symbiosis with certain trees. More than 20 tuber species grow in the temperate and Mediterranean forests of Europe, where truffles have been collected for centuries. Annual world truffle production during the last 100 years has dropped from 1000 to 200 tons (Olivier, 2000). Several species of the genus *Tuber* have high ecological and economic importance. Ascomata of few species of truffles such as *Tuber magnatum* and *Tuber melanosporum* are well known world-wide through their gastronomic value. Compared with those in Mediterranean region, truffles in Fenno-Scandinavia are less documented. Fries (1909) gave the first modern account of *Tuber* species in Scandinavia, listing three species, *T. aestivum*, *T. maculatum* and *T. rufum*. Up to now, Denmark has the most records in this region, with 6 white and 3 black truffles (Lange, 1956). In Sweden the number of tuber species known is five, including two black truffles, *T. aestivum* and *T. mesentericum* (Danell, 1996; Wedén *et al.*, 1998; Wedén *et al.*, 2001). Now Burgundy truffle (*T. aestivum* syn. *uncinatum*) has been produced in small commercial scale in Gotland (Wedén *et al.*, 2009). Truffles do not belong to the traditional Finnish kitchen nor are they a common topic in the media. *Tuber borchii* is the only truffle species with commercial value found naturally in Finland so far in Mushroom journal by Kosonen *et al.*

(2002). *Tuber borchii* is the only truffle species with gastronomic value found in Finland up to now. Differentiation of several white truffles on their morphological features is difficult especially for *T. maculatum* and *T. borchii*. Vittadini (1831) differentiated these tubers mainly by their smell, taste and microscopic characters. It's important to differentiate these two truffles for economic and regulatory reasons because *T. borchii* is allowed on Italian market and used in food products whereas *T. maculatum* is not. Mello *et al.* (2000) reported that *T. borchii* morphological character closely resembles *T. maculatum*. The aim was to identify the truffle species grown wild in Finnish forest and investigate their soil habitat characteristic and forest vegetation.

Materials and Methods

Truffles

Couple of wild truffles was found in the Finnish forest located in Lahti (100 km north of Helsinki) by using a trained dog (Ciro). For the purpose of the study, a representative number of unidentified hypogeous specimens presumably a genus of white truffles were collected and washed free of adhering soil and were kept in alcohol until the microscopy analysis. The samples were deposited in Herbarium of Juva Truffle Centre (ascocarps) and in parallel in the Herbarium and Mycotheca at the Helsinki University of Technology, Finland. Specimens with fully developed ascomata

and spores were used for the examination of microscopic morphological characteristics. All truffle ascocarps were identified on the basis of their shape, appearance and also on their microscopic features.

Soil and host plants

Soil sample was taken from the forest area where truffles were found. The surface litters and vegetation of the truffle habitat area was removed and then about 1 kilogram of the soil was collected for investigation. The water pH of the soil sample was determined. The ground vegetation of the forest area and the dominant trees growing in the truffles growing area was recorded. All potential truffle host plants from the vicinity of collected sporocarps were recorded.

Results

The fresh collected truffles were characterized according to Castellano *et al.* (1989) and Trappe and Castellano (2000). The wild Finnish truffles identified in this study were found in the forest with high pH (6.6) compared to the pH of Finnish forest which range from 4 - 4.5. Our studies showed that the spruce (*Picea abies*) were the dominant trees growing in the vicinity of the truffles with few pine trees. Five representative fresh or alcohol-stored ascocarps were examined for spore characteristics. *Tuber* species were first identified in the Laboratory of Bioprocess Engineering, Helsinki University of Technology, Finland and the further confirmation was performed in the University of Perugia and University of Bologna. The tubers were

identified as *Tuber scruposum* (recorded for the first time in Finland) and *Tuber maculatum*, (Figs 1, 2 respectively). *T. puberulum*, *T. borchii* and *Tuber maculatum* have been reported from many countries (Trappe and Castellano, 2000; Rioussset *et al.*, 2001; Ceruti *et al.*, 2003). A trained dog is an important tool in searching truffles. Further investigation concerning truffle species (DNA) and soil properties will be performed in the coming seasons.

Discussion

Our studies showed that the spruce trees (*Picea abies*) were the dominant trees growing close to the truffle habitats forest with few pine trees. Both Finnish truffle species identified in this study were picked out from the forest with a water pH of 6.6 which is higher than the typical Finish forest pH (4.3 - 4.5). This high pH value indicated that this forest was a former field. In Gotland, Sweden, *T. aestivum* grows wild in association with *Quercus robur* L. (pedunculate oak) and *Corylus avellana* (European hazel) in soil with pH values ranging from 6.8 to 7.8 (Weden *et al.*, 2004) whereas Polish *T. aestivum* grows wildly also in the vicinity of *Fagus sylvatica* and *Tilia cordata* trees (Hilszczanska and Sierota, 2008). Based on their morphological characters the collected truffles were identified as *T. maculatum* and *T. scruposum*. The results underline the need to support morphological studies with molecular identification techniques to ensure correct identification of tuber species. Our study provides an

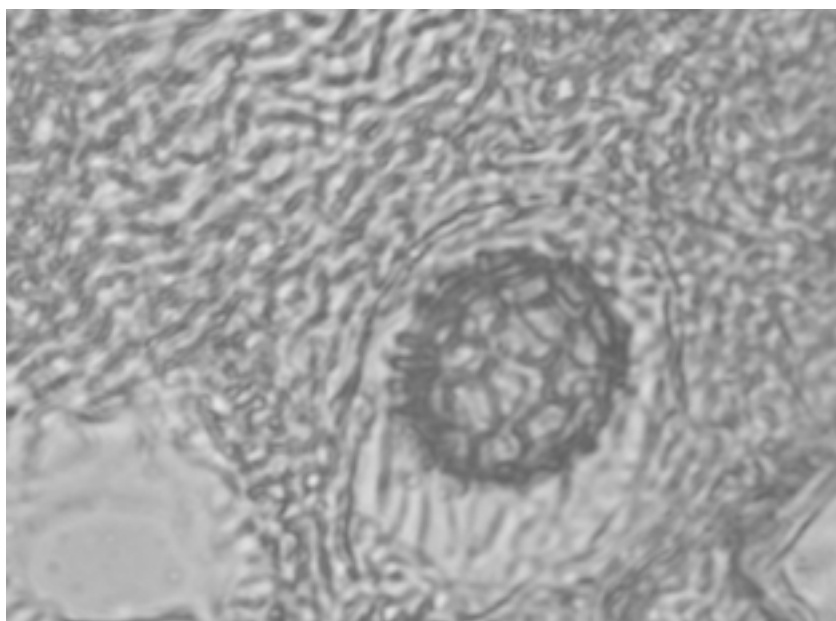


Fig.1 *Tuber scruposum*

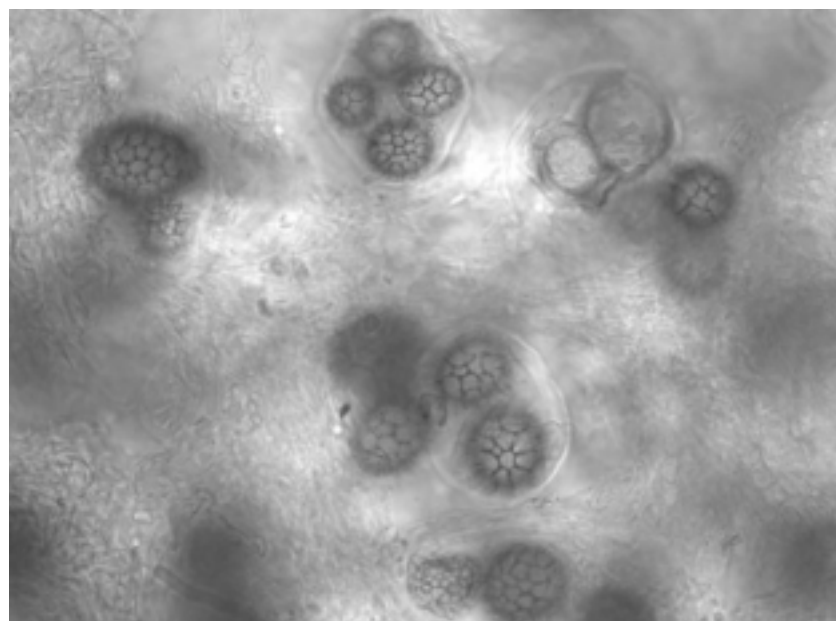


Fig.2 *Tuber maculatum*

improved basis for future monographs of the genus *tuber* especially wild white Finnish truffles . We are developing an applicable protocol to detect the truffle mycelia in the soil where truffles grow naturally . Due to the lack of historical Finnish records of truffles and the tradition of collecting and consuming truffles in Finland, it is very difficult to determine if and for how long the sites of wild white Finnish truffles have existed .

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